

SEQUENCE LISTING

(1) GENERAL INFORMATION:

170440

(i) APPLICANT: Wilson, Peter J
Morris, Charles P
Anson, Donald S
Occhiodoro, Teresa
Bielicki, Julie
Clements, Peter R
Hopwood, John J

(ii) TITLE OF INVENTION: GLYCOSYLATION VARIANTS OF
IDURONATE 2-SULFATASE

(iii) NUMBER OF SEQUENCES: 15

(iv) CORRESPONDENCE ADDRESS:

SECRET

(A) ADDRESSEE: Scully, Scott, Murphy & Presser
(B) STREET: 400 Garden City Plaza
(C) CITY: Garden City
(D) STATE: New York
(E) COUNTRY: USA
(F) ZIP: 11530

(v) COMPUTER READABLE FORM:

(A) MEDIUM TYPE: Floppy disk
(B) COMPUTER: IBM PC compatible
(C) OPERATING SYSTEM: PC-DOS/MS-DOS
(D) SOFTWARE: PatentIn Release #1.0, Version #1.25

(vi) CURRENT APPLICATION DATA:

(A) APPLICATION NUMBER: 991,973
(B) FILING DATE: 17-DEC-1992
(C) CLASSIFICATION:

(viii) ATTORNEY/AGENT INFORMATION:

(A) NAME: DiGiglio, Frank S
(B) REGISTRATION NUMBER: 31,346
(C) REFERENCE/DOCKET NUMBER: 8416Z

(ix) TELECOMMUNICATION INFORMATION:

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(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2297 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 125..1774

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

CGGCTGTGTT GCGCAGTCTT CATGGGTTCC CGACGAGGAG GTCTCTGTGG CTGCGGCGGC	60
TGCTAACTGC GCCACCTGCT GCAGCCTGTC CCCGCCGCTC TGAAGCGGCC GCGTCGAAGC	120
CGAA ATG CCG CCA CCC CGG ACC GGC CGA GGC CTT CTC TGG CTG GGT CTG	169
Met Pro Pro Pro Arg Thr Gly Arg Gly Leu Leu Trp Leu Gly Leu	
1 5 10 15	
GTT CTG AGC TCC GTC TGC GTC GCC CTC GGA TCC GAA ACG CAG GCC AAC	217
Val Leu Ser Ser Val Cys Val Ala Leu Gly Ser Glu Thr Gln Ala Asn	
20 25 30	
TCG ACC ACA GAT GCT CTG AAC GTT CTT CTC ATC ATC GTG GAT GAC CTG	265
Ser Thr Thr Asp Ala Leu Asn Val Leu Leu Ile Ile Val Asp Asp Leu	
35 40 45	
CGC CCC TCC CTG GGC TGT TAT GGG GAT AAG CTG GTG AGG TCC CCA AAT	313
Arg Pro Ser Leu Gly Cys Tyr Gly Asp Lys Leu Val Arg Ser Pro Asn	
50 55 60	
ATT GAC CAA CTG GCA TCC CAC AGC CTC CTC TTC CAG AAT GCC TTT GCG	361
Ile Asp Gln Leu Ala Ser His Ser Leu Leu Phe Gln Asn Ala Phe Ala	
65 70 75	
CAG CAA GCA GTG TGC GCC CCG AGC CGC GTT TCT TTC CTC ACT GGC AGG	409
Gln Gln Ala Val Cys Ala Pro Ser Arg Val Ser Phe Leu Thr Gly Arg	
80 85 90 95	
AGA CCT GAC ACC ACC CGC CTG TAC GAC TTC AAC TCC TAC TGG AGG GTG	457
Arg Pro Asp Thr Thr Arg Leu Tyr Asp Phe Asn Ser Tyr Trp Arg Val	
100 105 110	
CAC GCT GGA AAC TTC TCC ACC ATC CCC CAG TAC TTC AAG GAG AAT GGC	505
His Ala Gly Asn Phe Ser Thr Ile Pro Gln Tyr Phe Lys Glu Asn Gly	
115 120 125	

45

TAT Tyr	GTG Val	ACC Thr	ATG Met	TCG Ser	GTG Val	GGA Gly	AAA Lys	GTC Val	TTT Phe	CAC His	CCT Pro	GGG Gly	ATA Ile	TCT Ser	TCT Ser	553
		130					135					140				
AAC Asn	CAT His	ACC Thr	GAT Asp	GAT Asp	TCT Ser	CCG Pro	TAT Tyr	AGC Ser	TGG Trp	TCT Ser	TTT Phe	CCA Pro	CCT Pro	TAT Tyr	CAT His	601
		145				150					155					
CCT Pro	TCC Ser	TCT Ser	GAG Glu	AAG Lys	TAT Tyr	GAA Glu	AAC Asn	ACT Thr	AAG Lys	ACA Thr	TGT Cys	CGA Arg	GGG Gly	CCA Pro	GAT Asp	649
					165					170					175	
GGA Gly	GAA Glu	CTC Leu	CAT His	GCC Ala	AAC Asn	CTG Leu	CTT Leu	TGC Cys	CCT Pro	GTG Val	GAT Asp	GTG Val	CTG Leu	GAT Asp	GTT Val	697
				180					185					190		
CCC Pro	GAG Glu	GGC Gly	ACC Thr	TTG Leu	CCT Pro	GAC Asp	AAA Lys	CAG Gln	AGC Ser	ACT Thr	GAG Glu	CAA Gln	GCC Ala	ATA Ile	CAG Gln	745
			195					200					205			
TTG Leu	TTG Leu	GAA Glu	AAG Lys	ATG Met	AAA Lys	ACG Thr	TCA Ser	GCC Ala	AGT Ser	CCT Pro	TTC Phe	TTC Phe	CTG Leu	GCC Ala	GTT Val	793
		210					215					220				
GGG Gly	TAT Tyr	CAT His	AAG Lys	CCA Pro	CAC His	ATC Ile	CCC Pro	TTC Phe	AGA Arg	TAC Tyr	CCC Pro	AAG Lys	GAA Glu	TTT Phe	CAG Gln	841
		225				230					235					
AAG Lys	TTG Leu	TAT Tyr	CCC Pro	TTG Leu	GAG Glu	AAC Asn	ATC Ile	ACC Thr	CTG Leu	GCC Ala	CCC Pro	GAT Asp	CCC Pro	GAG Glu	GTC Val	889
					245					250					255	
CCT Pro	GAT Asp	GGC Gly	CTA Leu	CCC Pro	CCT Pro	GTG Val	GCC Ala	TAC Tyr	AAC Asn	CCC Pro	TGG Trp	ATG Met	GAC Asp	ATC Ile	AGG Arg	937
				260					265					270		
CAA Gln	CGG Arg	GAA Glu	GAC Asp	GTC Val	CAA Gln	GCC Ala	TTA Leu	AAC Asn	ATC Ile	AGT Ser	GTG Val	CCG Pro	TAT Tyr	GGT Gly	CCA Pro	985
			275					280					285			
ATT Ile	CCT Pro	GTG Val	GAC Asp	TTT Phe	CAG Gln	CGG Arg	AAA Lys	ATC Ile	CGC Arg	CAG Gln	AGC Ser	TAC Tyr	TTT Phe	GCC Ala	TCT Ser	1033
		290					295					300				
GTG Val	TCA Ser	TAT Tyr	TTG Leu	GAT Asp	ACA Thr	CAG Gln	GTC Val	GGC Gly	CGC Arg	CTC Leu	TTG Leu	AGT Ser	GCT Ala	TTG Leu	GAC Asp	1081
		305				310					315					
GAT Asp	CTT Leu	CAG Gln	CTG Leu	GCC Ala	AAC Asn	AGC Ser	ACC Thr	ATC Ile	ATT Ile	GCA Ala	TTT Phe	ACC Thr	TCG Ser	GAT Asp	CAT His	1129
					325					330					335	

GGG Gly	TGG Trp	GCT Ala	CTA Leu	GGT Gly	GAA Glu	CAT His	GGA Gly	GAA Glu	TGG Trp	GCC Ala	AAA Lys	TAC Tyr	AGC Ser	AAT Asn	TTT Phe	1177
				340					345						350	
GAT Asp	GTT Val	GCT Ala	ACC Thr	CAT His	GTT Val	CCC Pro	CTG Leu	ATA Ile	TTC Phe	TAT Tyr	GTT Val	CCT Pro	GGA Gly	AGG Arg	ACG Thr	1225
			355					360							365	
GCT Ala	TCA Ser	CTT Leu	CCG Pro	GAG Glu	GCA Ala	GGC Gly	GAG Glu	AAG Lys	CTT Leu	TTC Phe	CCT Pro	TAC Tyr	CTC Leu	GAC Asp	CCT Pro	1273
			370					375							380	
TTT Phe	GAT Asp	TCC Ser	GCC Ala	TCA Ser	CAG Gln	TTG Leu	ATG Met	GAG Glu	CCA Pro	GGC Gly	AGG Arg	CAA Gln	TCC Ser	ATG Met	GAC Asp	1321
			385				390									
CTT Leu	GTG Val	GAA Glu	CTT Leu	GTG Val	TCT Ser	CTT Leu	TTT Phe	CCC Pro	ACG Thr	CTG Leu	GCT Ala	GGA Gly	CTT Leu	GCA Ala	GGA Gly	1369
					400										415	
CTG Leu	CAG Gln	GTT Val	CCA Pro	CCT Pro	CGC Arg	TGC Cys	CCC Pro	GTT Val	CCT Pro	TCA Ser	TTT Phe	CAC His	GTT Val	GAG Glu	CTG Leu	1417
				420					425						430	
TGC Cys	AGA Arg	GAA Glu	GGC Gly	AAG Lys	AAC Asn	CTT Leu	CTG Leu	AAG Lys	CAT His	TTT Phe	CGA Arg	TTC Phe	CGT Arg	GAC Asp	TTG Leu	1465
				435				440							445	
GAA Glu	GAG Glu	GAT Asp	CCG Pro	TAC Tyr	CTC Leu	CCT Pro	GGT Gly	AAT Asn	CCC Pro	CGT Arg	GAA Glu	CTG Leu	ATT Ile	GCC Ala	TAT Tyr	1513
			450				455						460			
AGC Ser	CAG Gln	TAT Tyr	CCC Pro	CGG Arg	CCT Pro	TCA Ser	GAC Asp	ATC Ile	CCT Pro	CAG Gln	TGG Trp	AAT Asn	TCT Ser	GAC Asp	AAG Lys	1561
			465				470					475				
CCG Pro	AGT Ser	TTA Leu	AAA Lys	GAT Asp	ATA Ile	AAG Lys	ATC Ile	ATG Met	GGC Gly	TAT Tyr	TCC Ser	ATA Ile	CGC Arg	ACC Thr	ATA Ile	1609
					480						490				495	
GAC Asp	TAT Tyr	AGG Arg	TAT Tyr	ACT Thr	GTG Val	TGG Trp	GTT Val	GGC Gly	TTC Phe	AAT Asn	CCT Pro	GAT Asp	GAA Glu	TTT Phe	CTA Leu	1657
				500											510	
GCT Ala	AAC Asn	TTT Phe	TCT Ser	GAC Asp	ATC Ile	CAT His	GCA Ala	GGG Gly	GAA Glu	CTG Leu	TAT Tyr	TTT Phe	GTG Val	GAT Asp	TCT Ser	1705
			515					520							525	
GAC Asp	CCA Pro	TTG Leu	CAG Gln	GAT Asp	CAC His	AAT Asn	ATG Met	TAT Tyr	AAT Asn	GAT Asp	TCC Ser	CAA Gln	GGT Gly	GGA Gly	GAT Asp	1753
			530				535									540

CTT TTC CAG TTG TTG ATG CCT TGAGTTTTGC CAACCATGGA TGGCAAATGT 1804
 Leu Phe Gln Leu Leu Met Pro 550

GATGTGCTCC CTTCCAGCTG GTGAGAGGAG GAGTTAGAGC TGGTCGTTTT GTGATTACCC 1864
 ATAATATTGG AAGCAGCCTG AGGGCTAGTT AATCCAAACA TGCATCAACA ATTTGGCCTG 1924
 AGAATATGTA ACAGCCAAAC CTTTTCGTTT AGTCTTTATT AAAATTTATA ATTGGTAATT 1984
 GGACCAGTTT TTTTTTTAAT TTCCCTCTTT TTAACACAGT TACGGCTTAT TTAAGTAATA 2044
 AATACAAAGC AAACAAACTC AAGTTATGTC ATACCTTTGG ATACGAAGAC CATAATAAT 2104
 AACCAAACAT AACATTATAC ACAAAGAATA CTTTCATTAT TTGTGGAATT TAGTGCATTT 2164
 CAAAAGTAA TCATATATCA AACTAGGCAC CACACTAAGT TCCTGATTAT TTTGTTTATA 2224
 ATTTAATAAT ATATCTTATG AGCCCTATAT ATTCAAATA TTATGTTAAC ATGTAATCCA 2284
 TGTTTCTTTT TCC 2297

(2) INFORMATION FOR SEQ ID NO:2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 550 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Met Pro Pro Pro Arg Thr Gly Arg Gly Leu Leu Trp Leu Gly Leu Val
 1 5 10 15
 Leu Ser Ser Val Cys Val Ala Leu Gly Ser Glu Thr Gln Ala Asn Ser
 20 25 30
 Thr Thr Asp Ala Leu Asn Val Leu Leu Ile Ile Val Asp Asp Leu Arg
 35 40 45
 Pro Ser Leu Gly Cys Tyr Gly Asp Lys Leu Val Arg Ser Pro Asn Ile
 50 55 60
 Asp Gln Leu Ala Ser His Ser Leu Leu Phe Gln Asn Ala Phe Ala Gln
 65 70 75 80
 Gln Ala Val Cys Ala Pro Ser Arg Val Ser Phe Leu Thr Gly Arg Arg
 85 90 95
 Pro Asp Thr Thr Arg Leu Tyr Asp Phe Asn Ser Tyr Trp Arg Val His
 100 105 110

Ala	Gly	Asn	Phe	Ser	Thr	Ile	Pro	Gln	Tyr	Phe	Lys	Glu	Asn	Gly	Tyr		
		115					120					125					
Val	Thr	Met	Ser	Val	Gly	Lys	Val	Phe	His	Pro	Gly	Ile	Ser	Ser	Asn		
		130				135					140						
His	Thr	Asp	Asp	Ser	Pro	Tyr	Ser	Trp	Ser	Phe	Pro	Pro	Tyr	His	Pro		
		145			150					155					160		
Ser	Ser	Glu	Lys	Tyr	Glu	Asn	Thr	Lys	Thr	Cys	Arg	Gly	Pro	Asp	Gly		
				165					170					175			
Glu	Leu	His	Ala	Asn	Leu	Leu	Cys	Pro	Val	Asp	Val	Leu	Asp	Val	Pro		
			180					185					190				
Glu	Gly	Thr	Leu	Pro	Asp	Lys	Gln	Ser	Thr	Glu	Gln	Ala	Ile	Gln	Leu		
		195					200					205					
Leu	Glu	Lys	Met	Lys	Thr	Ser	Ala	Ser	Pro	Phe	Phe	Leu	Ala	Val	Gly		
		210				215					220						
Tyr	His	Lys	Pro	His	Ile	Pro	Phe	Arg	Tyr	Pro	Lys	Glu	Phe	Gln	Lys		
		225			230					235					240		
Leu	Tyr	Pro	Leu	Glu	Asn	Ile	Thr	Leu	Ala	Pro	Asp	Pro	Glu	Val	Pro		
				245					250					255			
Asp	Gly	Leu	Pro	Pro	Val	Ala	Tyr	Asn	Pro	Trp	Met	Asp	Ile	Arg	Gln		
			260					265					270				
Arg	Glu	Asp	Val	Gln	Ala	Leu	Asn	Ile	Ser	Val	Pro	Tyr	Gly	Pro	Ile		
		275					280					285					
Pro	Val	Asp	Phe	Gln	Arg	Lys	Ile	Arg	Gln	Ser	Tyr	Phe	Ala	Ser	Val		
		290				295					300						
Ser	Tyr	Leu	Asp	Thr	Gln	Val	Gly	Arg	Leu	Leu	Ser	Ala	Leu	Asp	Asp		
					310					315					320		
Leu	Gln	Leu	Ala	Asn	Ser	Thr	Ile	Ile	Ala	Phe	Thr	Ser	Asp	His	Gly		
				325					330					335			
Trp	Ala	Leu	Gly	Glu	His	Gly	Glu	Trp	Ala	Lys	Tyr	Ser	Asn	Phe	Asp		
			340					345					350				
Val	Ala	Thr	His	Val	Pro	Leu	Ile	Phe	Tyr	Val	Pro	Gly	Arg	Thr	Ala		
		355					360					365					
Ser	Leu	Pro	Glu	Ala	Gly	Glu	Lys	Leu	Phe	Pro	Tyr	Leu	Asp	Pro	Phe		
		370				375					380						
Asp	Ser	Ala	Ser	Gln	Leu	Met	Glu	Pro	Gly	Arg	Gln	Ser	Met	Asp	Leu		
					390					395					400		

Val Glu Leu Val Ser Leu Phe Pro Thr Leu Ala Gly Leu Ala Gly Leu
 405 410 415
 Gln Val Pro Pro Arg Cys Pro Val Pro Ser Phe His Val Glu Leu Cys
 420 425 430
 Arg Glu Gly Lys Asn Leu Leu Lys His Phe Arg Phe Arg Asp Leu Glu
 435 440 445
 Glu Asp Pro Tyr Leu Pro Gly Asn Pro Arg Glu Leu Ile Ala Tyr Ser
 450 455 460
 Gln Tyr Pro Arg Pro Ser Asp Ile Pro Gln Trp Asn Ser Asp Lys Pro
 465 470 475 480
 Ser Leu Lys Asp Ile Lys Ile Met Gly Tyr Ser Ile Arg Thr Ile Asp
 485 490 495
 Tyr Arg Tyr Thr Val Trp Val Gly Phe Asn Pro Asp Glu Phe Leu Ala
 500 505 510
 Asn Phe Ser Asp Ile His Ala Gly Glu Leu Tyr Phe Val Asp Ser Asp
 515 520 525
 Pro Leu Gln Asp His Asn Met Tyr Asn Asp Ser Gln Gly Gly Asp Leu
 530 535 540
 Phe Gln Leu Leu Met Pro
 545 550

(2) INFORMATION FOR SEQ ID NO:3:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 16 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

Pro Arg Glu Leu Ile Ala Tyr Ser Asn Tyr Pro Arg Asn Asn Ile Pro
 1 5 10 15

(2) INFORMATION FOR SEQ ID NO:4:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 49 base pairs
- (B) TYPE: nucleic acid

50

- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

ACTAGTAGCA CCTGCTGGAC GCCGGGAGGG ACCCGCTGAT GCTGCTGCA

49

(2) INFORMATION FOR SEQ ID NO:5:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 25 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

Thr	Ser	Ala	Leu	Asn	Val	Leu	Leu	Ile	Ile	Val	Asp	Asp	Leu	Arg	Pro
1				5				10						15	
Ser Leu Gly Asp Tyr Asp Asp Val Leu															
20 25															

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 4428 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 332..434

(ix) FEATURE:

- (A) NAME/KEY: intron
- (B) LOCATION: 536..537

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 693..829

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(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 962..963

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 1044..1221

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 1350..1351

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 1480..1569

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 1716..1717

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 1841..2041

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 2206..2207

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 2294..2464

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 2585..2586

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 2684..2810

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 2904..2905

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 3033..3206

(ix) FEATURE:

(A) NAME/KEY: intron
(B) LOCATION: 3308..3309

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 3435..3908

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

GCGATCTAGA CCTAGTTAGC CAAGTCTCTA ACGTGACATA GGGAAAGCTT GCAATGGCAA	60
CTGGCCGCCC GTCTGCGCCT GTCTCTCGCC ACGCCTATTG CTGCAGGATG ACGCGCACCT	120
CTATGAACCC GCCGTGAGGT GTGAGTGTGA CGCAGGGAAG AGTCGCACGG ACGCACTCGC	180
GCTGCGGCCA GCTGCGGGCC CGGGCGGCGG CTGTGTTGCG CAGTCTTCAT GGGTTCCCGA	240
CGAGGAGGTC TCTGTGGCTG CGGCGGCTGC TAACTGCGCC ACCTGCTGCA GCCTGTCCCC	300
GCCGCTCTGA AGCGGCCGCG TCGAAGCCGA AATGCCGCCA CCGCGGACCG GCCGAGGCCT	360
TCTCTGGCTG GGTCTGGTTC TGAGCTCCGT CTGCGTCGCC CTCGGATCCG AAACGCAGGC	420
GAAGTCGACC ACAGGTGCCG CCCACGCCCT CCCTGCCATC TCTTCTCCCT TCCTCCCTCC	480
CTTCCTTCCT CCTTCCTTCT TTCCTTCCTT CTTTGTTTAT ATCCATTCTT TTTACCCCCC	540
ACTCCACCC TTGCTGAGGC ACAGCGCCCT CCCTGGCTAG GCTGTTAGGT GCAGGGTCCA	600
GCCTTGGGCC TCTTAGTAAC CTAGCACCTA CCATGAGGGA GGGTTCAGTG TCAGTGCAGG	660
TTACCTCACC AAAGCCCCTC CCTCCTGTGT AGATGCTCTG AACGTCTTC TCATCATCGT	720
GGATGACCTG CGCCCCCTCCC TGGGCTGTTA TGGGGATAAG CTGGTGAGGT CCCCAAATAT	780
TGACCAACTG GCATCCCACA GCCTCCTCTT CCAGAATGCC TTTGCGCAGG TATGTCTGGG	840
AACCTCTAGC TGTGGGTGTG TGCTGCTTCG TGCACTGAGG GTTGGGGGCG GGGAGCTTCA	900
GCTATTGTCA GATGGCACAG ATTGTCGCGG ACATCTTGTT AGAGGGAAGC ATAGTCTGGA	960
AAAGGGCGGT TGCTTGGTTA CCTAAGAGAT GGCAGACATG TTTTGCTGTG GCGATGCTTA	1020
CCTCTGCTTC TGCTCCCTAA CAGCAAGCAG TGTGCGCCCC GAGCCGCGTT TCTTTCCTCA	1080
CTGGCAGGAG ACCTGACACC ACCCGCCTGT ACGACTTCAA CTCCTACTGG AGGGTGCACG	1140

CTGGAAACTT	CTCCACCATC	CCCCAGTACT	TCAAGGAGAA	TGGCTATGTG	ACCATGTCGG	1200
TGGGAAAAGT	CTTTCACCCT	GGTACTGCTC	CATGTCCAGA	GTCTGGGTTC	TCTTGGTTTG	1260
TGGTGTCTGA	NTCCAGCATT	CCCATCCTGG	GGATGGGCTG	TCTTTGCAGA	GCCCTCTTCT	1320
GGCTGGGCGA	GTCCCTCGCT	AGTCAGTGCT	TTTGTAGATG	AGGAAACTGA	GCCCCAAAGA	1380
AGGGAGGNTC	CACTTGCCCA	TTTGTTTACA	GAGTTTTAAT	TATGGGGAGT	GGGGTGTTGA	1440
AAGACTCATC	ATGTTTTAAC	AACCTTTTTT	TTTTTCCAAG	GGATATCTTC	TAACCATAACC	1500
GATGATTCTC	CGTATAGCTG	GTCTTTTCCA	CCTTATCATC	CTTCCTCTGA	GAAGTATGAA	1560
AACACTAAGG	TAAGGCTGTG	AAAGGGACAT	TTCTGAAGAG	GAACCACTTT	TTCCTTTGTC	1620
ACATAAACTA	CTGGGTATAC	TGCATGTNCT	GTGAAGCTGG	TTATATACCA	CGAAGTTGTG	1680
GGTTTCATTT	GTGATAATGT	TTTGACAGAA	GTAAGTTGTT	CAGTCTGAGT	GACTAACACG	1740
TGAAGGGCTG	ATTATGTGAA	CATTAAATCT	GTGTGTGTAG	CCTTCATGGC	TTCATNTCTT	1800
GCACTTAAAA	AGCTGATGTT	ATATTATTTT	GTTTTGAAAG	ACATGTCGAG	GGCCAGATGG	1860
AGAACTCCAT	GCCAACCTGC	TTTGCCCTGT	GGATGTGCTG	GATGTTCCCG	AGGGCACCTT	1920
GCCTGACAAA	CAGAGCACTG	AGCAAGCCAT	ACAGTTGTTG	GAAAAGATGA	AAACGTCAGC	1980
CAGTCCTTTC	TTCCTGGCCG	TTGGGTATCA	TAAGCCACAC	ATCCCCTTCA	GATACCCCAA	2040
GGTGAAGAGC	TGGTTGAGGG	CTGATCCAGC	ACAGCTGTGA	CAGCTGTGTT	GTTTGTGAG	2100
GGAGGGATTT	GCACAGGGAA	GGTGGCTACA	TCCTGCCATC	GCCAGGCACC	ATGGTTGCCT	2160
GATGGGCACT	AGTGTCTCTA	GTGGAGTAAA	GATGGGATTT	AGAGGTAAAA	GGCAGTATAG	2220
ACAGTGATAG	AGCCACAAGC	TTGTGCTTTT	GCTAAAAGAG	TGACAACTTT	GTGGCTTTGT	2280
GTTTTTCCCC	AAGGAATTTT	AGAAGTTGTA	TCCCTTGGAG	AACATCACCC	TGGCCCCCGA	2340
TCCCGAGGTC	CCTGATGGCC	TACCCCTGT	GGCCTACAAC	CCCTGGATGG	ACATCAGGCA	2400
ACGGGAAGAC	GTCCAAGCCT	TAAACATCAG	TGTGCCGTAT	GGTCCAATTC	CTGTGGACTT	2460
TCAGGTATCA	AGGACATAGT	TTGGGGATGT	ATTGGACACT	GATGACATAG	TGTCGTAGGT	2520
GAAACCACTC	TTCTCAGTAG	ACACAACTCC	ACCTATAATG	TCTTATTAAG	AGCTTTCTTT	2580
GTGTGTAGGG	ATTGGGAGAG	ATGCACACGG	CAAGCATTAT	CTCTGTATGC	CTTGGCAATT	2640
TAAATTGCAG	TCACTCTCAT	TTTTATTTTT	TTTCAATTTG	CAGCGGAAAA	TCCGCCAGAG	2700
CTACTTTGCC	TCTGTGTCAT	ATTTGGATAC	ACAGGTCGGC	CGCCTCTTGA	GTGCTTTGGA	2760

CGATCTTCAG	CTGGCCAACA	GCACCATCAT	TGCATTTACC	TCGGATCATG	GTAAGCATTT	2820
TGAAATTCCC	TGGTGAGTCA	AAACATCTGA	ACTTTCCTGT	GAAACATGCT	TTGCAAAATT	2880
GCCATTGACA	TAAACATGGG	TGTGTTTCTT	CTAGGTGATG	AGTTTCTACT	TCCTCTGGTT	2940
TTTACAACAG	GAAATGAAAT	GGTATCTAAA	ATAAACAAGC	TGTGGTATGA	TGATTATTCA	3000
TTTTCTGTCA	TTCTGTGCTT	TTTATGAACT	AGGGTGGGCT	CTAGGTGAAC	ATGGAGAATG	3060
GGCCAAATAC	AGCAATTTTG	ATGTTGCTAC	CCATGTTCCC	CTGATATTCT	ATGTTCCCTGG	3120
AAGGACGGCT	TCACTTCCGG	AGGCAGGCGA	GAAGCTTTTC	CCTTACCTCG	ACCCTTTTGA	3180
TTCCGCCTCA	CAGTTGATGG	AGCCAGGTAT	AAAATATGCT	GAAATGATAT	TGCTTGACAG	3240
TAAGATCACC	TTTAGTTTAT	ATGTGAACCA	CTTTATTGAA	TCATAGGCTT	TGGGGTTACA	3300
CAGACCCCAA	AGATAAATGG	TGTAAATTAA	AAAAAGAAAA	CATATGGAGC	CCAGACAGGG	3360
TCCTTTACTG	CTCCTGCCTG	GCCATGGCAG	GCTTTTATAA	TGTAACCCAT	TCTGCTCTGT	3420
CGCTTCCTGT	TTCAGGCAGG	CAATCCATGG	ACCTTGTGGA	ACTTGTGTCT	CTTTTTCCCA	3480
CGCTGGCTGG	ACTTGCAGGA	CTGCAGGTTC	CACCTCGCTG	CCCCGTTCCCT	TCATTTACAG	3540
CTGAGCTGTG	CAGAGAAGGC	AAGAACCTTC	TGAAGCATTT	TCGATTCCGT	GACTTGGAAG	3600
AGGATCCGTA	CCTCCCTGGT	AATCCCCGTG	AACTGATTGC	CTATAGCCAG	TATCCCCGGC	3660
CTTCAGACAT	CCCTCAGTGG	AATTCTGACA	AGCCGAGTTT	AAAAGATATA	AAGATCATGG	3720
GCTATTCCAT	ACGCACCATA	GACTATAGGT	ATACTGTGTG	GGTTGGCTTC	AATCCTGATG	3780
AATTTCTAGC	TAACTTTTCT	GACATCCATG	CAGGGGAACT	GTATTTTGTG	GATTCTGACC	3840
CATTGCAGGA	TCACAATATG	TATAATGATT	CCCAAGGTGG	AGATCTTTTC	CAGTTGTTGA	3900
TGCCTTGAGT	TTTGCCAACC	ATGGATGGCA	AATGTGATGT	GCTCCCTTCC	AGCTGGTGAG	3960
AGGAGGAGTT	AGAGCTGGTC	GTTTTGTGAT	TACCCATAAT	ATTGGAAGCA	GCCTGAGGGC	4020
TAGTTAATCC	AAACATGCAT	CAACAATTTG	GCCTGAGAAT	ATGTAACAGC	CAAACCTTTT	4080
CGTTTAGTCT	TTATTAAAAT	TTATAATTGG	TAATTGGACC	AGTTTTTTTTT	TTAATTTCCC	4140
TCTTTTTTAAA	ACAGTTACGG	CTTATTTACT	GAATAAATAC	AAAGCAAACA	AACTCAAGTT	4200
ATGTCATACC	TTTGGATACG	AAGACCATAC	ATAATAACCA	AACATAACAT	TATACACAAA	4260
GAATACTTTC	ATTATTTGTG	GAATTTAGTG	CATTTCAAAA	AGTAATCATA	TATCAAACATA	4320

GGCACACAC TAAGTTCCTG ATTATTTTGT TTATAATTTA ATAATATATC TTATGAGCCC 4380
 TATATATTCA AAATATTATG TTAACATGTA ATCCATGTTT CTTTTTCC 4428

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 16 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

Pro Arg Glu Leu Ile Ala Tyr Ser Xaa Tyr Pro Arg Xaa Xaa Ile Pro
 1 5 10 15

(2) INFORMATION FOR SEQ ID NO:8:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 5 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

Cys Thr Pro Ser Arg
 1 5

(2) INFORMATION FOR SEQ ID NO:9:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 6 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

Gly Lys Trp His Leu Gly
 1 5

(2) INFORMATION FOR SEQ ID NO:10:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 81 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

GGCCTCTAGA CCAGCTACAG TCGGAAACCA TCAGCAAGCA GGTCATTGTT CCAACATGCC
GCCACCCCGG ACCGGCCGAG G

60

81

(2) INFORMATION FOR SEQ ID NO:11:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 510 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

Thr Arg Arg Pro Asn Val Val Leu Leu Leu Thr Asp Asp Gln Asp Glu
1 5 10 15
Val Leu Gly Gly Met Thr Pro Leu Lys Lys Thr Lys Ala Leu Ile Gly
20 25 30
Glu Met Gly Met Thr Phe Ser Ser Ala Tyr Val Pro Ser Ala Leu Cys
35 40 45
Cys Pro Ser Arg Ala Ser Ile Leu Thr Gly Lys Tyr Pro His Asn His
50 55 60
His Val Val Asn Asn Thr Leu Glu Gly Asn Cys Ser Ser Lys Ser Trp
65 70 75 80
Gln Lys Ile Gln Glu Pro Asn Thr Phe Pro Ala Ile Leu Arg Ser Met
85 90 95
Gln Gly Tyr Gln Thr Phe Thr Phe Phe Ala Gly Lys Tyr Leu Asn Glu
100 105 110
Tyr Gly Ala Pro Asp Ala Gly Gly Leu Glu His Val Pro Leu Gly Trp
115 120 125

Ser Tyr Trp Tyr Ala Leu Glu Lys Asn Ser Lys Tyr Tyr Asn Tyr Thr
 130 135 140
 Leu Ser Ile Asn Gly Lys Ala Arg Lys His Gly Glu Asn Tyr Ser Val
 145 150 155 160
 Asp Tyr Leu Thr Asp Val Leu Ala Asn Val Ser Leu Asp Phe Leu Asp
 165 170 175
 Tyr Lys Ser Asn Glu Glu Pro Phe Phe Met Met Ile Ala Thr Pro Ala
 180 185 190
 Pro His Ser Pro Trp Thr Ala Ala Pro Gln Tyr Gln Lys Ala Phe Gln
 195 200 205
 Asn Val Phe Ala Pro Arg Asn Lys Asn Phe Asn Ile His Gly Thr Asn
 210 215 220
 Lys His Trp Leu Ile Arg Gln Ala Lys Thr Pro Met Thr Asn Ser Ser
 225 230 235 240
 Ile Gln Phe Leu Asp Asn Ala Phe Arg Lys Arg Trp Gln Thr Leu Leu
 245 250 255
 Ser Val Asp Asp Leu Val Glu Lys Leu Val Lys Arg Leu Glu Phe Thr
 260 265 270
 Gly Glu Leu Asn Asn Thr Tyr Ile Phe Tyr Thr Ser Asp Asn Gly Tyr
 275 280 285
 His Thr Gly Gln Phe Ser Leu Pro Ile Asp Lys Arg Gln Leu Tyr Glu
 290 295 300
 Phe Asp Ile Lys Val Pro Leu Leu Val Arg Gly Pro Gly Ile Lys Pro
 305 310 315 320
 Asn Gln Thr Ser Lys Met Leu Val Ala Asn Ile Asp Leu Gly Pro Ile
 325 330 335
 Leu Asp Ile Ala Gly Tyr Asp Leu Asn Lys Thr Gln Met Asp Gly Met
 340 345 350
 Ser Leu Leu Pro Ile Leu Arg Gly Ala Ser Asn Leu Thr Trp Arg Ser
 355 360 365
 Asp Val Leu Val Glu Tyr Gln Gly Glu Gly Arg Asn Val Thr Asp Pro
 370 375 380
 Thr Cys Pro Ser Leu Ser Pro Gly Val Ser Gln Cys Phe Pro Asp Cys
 385 390 395 400
 Val Cys Glu Asp Ala Tyr Asn Asn Thr Tyr Ala Cys Val Arg Thr Met
 405 410 415

Ser Ala Leu Trp Asn Leu Gln Tyr Cys Glu Phe Asp Asp Gln Glu Val
 420 425 430
 Phe Val Glu Val Tyr Asn Leu Thr Ala Asp Pro Asp Gln Ile Thr Asn
 435 440 445
 Ile Ala Lys Thr Ile Asp Pro Glu Leu Leu Gly Lys Met Asn Tyr Arg
 450 455 460
 Leu Met Met Leu Gln Ser Cys Ser Gly Pro Thr Cys Arg Thr Pro Gly
 465 470 475 480
 Val Phe Asp Pro Gly Tyr Arg Phe Asp Pro Arg Leu Met Phe Ser Asn
 485 490 495
 Arg Gly Ser Val Arg Thr Arg Arg Phe Ser Lys His Leu Leu
 500 505 510

(2) INFORMATION FOR SEQ ID NO:12:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 507 amino acids.
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

Met Gly Ala Pro Arg Ser Leu Leu Leu Ala Leu Ala Ala Gly Leu Ala
 1 5 10 15
 Val Ala Arg Pro Pro Asn Ile Val Leu Ile Phe Ala Asp Asp Leu Gly
 20 25 30
 Tyr Gly Asp Leu Gly Cys Tyr Gly His Pro Ser Ser Thr Thr Pro Asn
 35 40 45
 Leu Asp Gln Leu Ala Ala Gly Gly Leu Arg Phe Thr Asp Phe Tyr Val
 50 55 60
 Pro Val Ser Leu Gln Thr Pro Ser Arg Ala Ala Leu Leu Thr Gln Arg
 65 70 75 80
 Leu Pro Val Arg Met Gly Met Tyr Pro Gly Val Leu Val Pro Ser Ser
 85 90 95
 Arg Gly Gly Leu Pro Leu Glu Glu Val Thr Val Ala Glu Val Leu Ala
 100 105 110
 Ala Arg Gly Tyr Leu Thr Gly Met Ala Gly Lys Trp His Leu Gly Val
 115 120 125

Gly	Pro	Glu	Gly	Ala	Phe	Leu	Pro	Pro	His	Gln	Gly	Phe	His	Arg	Phe	130	135	140
Leu	Gly	Ile	Pro	Tyr	Ser	His	Asp	Gln	Gly	Pro	Cys	Gln	Asn	Leu	Thr	145	150	155
Cys	Phe	Pro	Pro	Ala	Thr	Pro	Cys	Asp	Gly	Gly	Cys	Asp	Gln	Gly	Leu	165	170	175
Val	Pro	Ile	Pro	Leu	Leu	Ala	Asn	Leu	Ser	Val	Glu	Ala	Gln	Pro	Pro	180	185	190
Trp	Leu	Pro	Gly	Leu	Glu	Ala	Arg	Tyr	Met	Ala	Phe	Ala	His	Asp	Leu	195	200	205
Met	Ala	Asp	Ala	Gln	Arg	Gln	Asp	Arg	Pro	Phe	Phe	Leu	Tyr	Tyr	Ala	210	215	220
Ser	His	His	Thr	His	Tyr	Pro	Gln	Phe	Ser	Gly	Gln	Ser	Phe	Ala	Glu	225	230	235
Arg	Ser	Gly	Arg	Gly	Pro	Phe	Gly	Asp	Ser	Leu	Met	Glu	Leu	Asp	Ala	245	250	255
Ala	Val	Gly	Thr	Leu	Met	Thr	Ala	Ile	Gly	Asp	Leu	Gly	Leu	Leu	Glu	260	265	270
Glu	Thr	Leu	Val	Ile	Phe	Thr	Ala	Asp	Asn	Gly	Pro	Glu	Thr	Met	Arg	275	280	285
Met	Ser	Arg	Gly	Gly	Cys	Ser	Gly	Leu	Leu	Arg	Cys	Gly	Lys	Gly	Thr	290	295	300
Thr	Tyr	Glu	Gly	Gly	Val	Arg	Glu	Pro	Ala	Leu	Ala	Phe	Trp	Pro	Gly	305	310	315
His	Ile	Ala	Pro	Gly	Val	Thr	His	Glu	Leu	Ala	Ser	Ser	Leu	Asp	Leu	325	330	335
Leu	Pro	Thr	Leu	Ala	Ala	Leu	Ala	Gly	Ala	Pro	Leu	Pro	Asn	Val	Thr	340	345	350
Leu	Asp	Gly	Phe	Asp	Leu	Arg	Pro	Pro	Ala	Ala	Gly	His	Arg	Gln	Glu	355	360	365
Pro	Ser	Ala	Val	Ser	Leu	Leu	Leu	Pro	Val	Leu	Pro	Arg	Arg	Gly	Pro	370	375	380
Trp	Gly	Phe	Cys	Cys	Ala	Asp	Trp	Lys	Val	Gln	Gly	Ser	Leu	Leu	His	385	390	395
Pro	Gly	Ser	Ala	His	Ser	Asp	Thr	Thr	Ala	Asp	Pro	Ala	Cys	His	Ala	405	410	415

Ser Ser Ser Leu Thr Ala His Glu Pro Pro Leu Leu Tyr Asp Leu Ser
 420 425 430
 Lys Asp Pro Gly Glu Asn Tyr Asn Leu Leu Gly Gly Val Ala Gly Ala
 435 440 445
 Thr Pro Glu Val Leu Gln Ala Leu Lys Gln Leu Gln Leu Leu Lys Ala
 450 455 460
 Gln Leu Asp Ala Ala Val Thr Phe Gly Pro Ser Gln Val Ala Arg Gly
 465 470 475 480
 Glu Asp Pro Ala Leu Gln Ile Cys Cys His Pro Gly Cys Thr Pro Arg
 485 490 495
 Pro Ala Cys Cys His Cys Pro Asp Pro His Ala
 500 505

(2) INFORMATION FOR SEQ ID NO:13:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 533 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

Met Gly Pro Arg Gly Ala Ala Ser Leu Pro Arg Gly Pro Gly Pro Arg
 1 5 10 15
 Arg Leu Leu Leu Pro Val Val Leu Pro Leu Leu Leu Leu Leu Leu
 20 25 30
 Ala Pro Pro Gly Ser Gly Ala Gly Ala Ser Arg Pro Pro His Leu Val
 35 40 45
 Phe Leu Leu Ala Asp Asp Leu Gly Trp Asn Asp Val Gly Phe His Gly
 50 55 60
 Ser Arg Ile Arg Thr Pro His Leu Asp Ala Leu Ala Ala Gly Gly Val
 65 70 75 80
 Leu Leu Asp Asn Tyr Tyr Thr Gln Pro Leu Cys Thr Pro Ser Arg Ser
 85 90 95
 Gln Leu Leu Thr Gln Arg Tyr Gln Ile Arg Thr Gly Leu Gln His Gln
 100 105 110
 Ile Ile Trp Pro Cys Gln Pro Ser Cys Val Pro Leu Asp Glu Lys Leu
 115 120 125

cel

Leu	Pro	Gln	Leu	Leu	Lys	Glu	Ala	Gly	Tyr	Thr	Thr	His	Met	Val	Gly	
130						135						140				
Lys	Trp	His	Leu	Gly	Met	Tyr	Arg	Lys	Glu	Cys	Leu	Pro	Thr	Arg	Arg	
145					150					155					160	
Gly	Phe	Asp	Thr	Tyr	Phe	Gly	Tyr	Leu	Leu	Gly	Ser	Glu	Asp	Tyr	Tyr	
				165					170					175		
Ser	His	Glu	Arg	Cys	Thr	Leu	Ile	Asp	Ala	Leu	Asn	Val	Thr	Arg	Cys	
			180					185					190			
Ala	Leu	Asp	Phe	Arg	Asp	Gly	Glu	Glu	Val	Ala	Thr	Gly	Tyr	Lys	Asn	
		195					200					205				
Met	Tyr	Ser	Thr	Asn	Ile	Phe	Thr	Lys	Arg	Ala	Ile	Ala	Leu	Ile	Thr	
210						215					220					
Asn	His	Pro	Pro	Glu	Lys	Pro	Leu	Phe	Leu	Tyr	Leu	Ala	Leu	Gln	Ser	
225					230					235					240	
Val	His	Glu	Pro	Leu	Gln	Val	Pro	Glu	Glu	Tyr	Leu	Lys	Pro	Tyr	Asp	
				245					250					255		
Phe	Ile	Gln	Asp	Lys	Asn	Arg	His	His	Tyr	Ala	Gly	Met	Val	Ser	Leu	
			260					265					270			
Met	Asp	Glu	Ala	Val	Gly	Asn	Val	Thr	Ala	Ala	Leu	Lys	Ser	Ser	Gly	
		275					280					285				
Leu	Trp	Asn	Asn	Ile	Val	Phe	Ile	Phe	Ser	Thr	Asp	Asn	Gly	Gly	Gln	
290						295					300					
Thr	Leu	Ala	Gly	Gly	Asn	Asn	Trp	Pro	Leu	Arg	Gly	Arg	Lys	Trp	Ser	
305					310					315					320	
Leu	Trp	Glu	Gly	Gly	Val	Arg	Gly	Val	Gly	Phe	Val	Ala	Ser	Pro	Leu	
				325					330					335		
Leu	Lys	Gln	Lys	Gly	Val	Lys	Asn	Arg	Glu	Leu	Ile	His	Ile	Ser	Asp	
			340					345					350			
Trp	Leu	Pro	Thr	Leu	Val	Lys	Leu	Ala	Arg	Gly	His	Thr	Asn	Gly	Thr	
		355					360					365				
Lys	Pro	Leu	Asp	Gly	Phe	Asp	Val	Trp	Lys	Thr	Ile	Ser	Glu	Gly	Ser	
370						375					380					
Pro	Ser	Pro	Arg	Ile	Glu	Leu	Leu	His	Asn	Ile	Asp	Pro	Asn	Phe	Val	
385					390					395					400	
Asp	Ser	Ser	Pro	Cys	Pro	Arg	Asn	Ser	Met	Ala	Pro	Ala	Lys	Asp	Asp	
				405					410					415		

Ser Ser Leu Pro Glu Tyr Ser Ala Phe Asn Thr Ser Val His Ala Ala
420 425 430

Ile Arg His Gly Asn Trp Lys Leu Leu Thr Gly Tyr Pro Gly Cys Gly
435 440 445

Tyr Trp Phe Pro Pro Pro Ser Gln Tyr Asn Val Ser Glu Ile Pro Ser
450 455 460

Ser Asp Pro Pro Thr Lys Thr Leu Trp Leu Phe Asp Ile Asp Arg Asp
465 470 475 480

Pro Glu Glu Arg His Asp Leu Ser Arg Glu Tyr Pro His Ile Val Thr
485 490 495

Lys Leu Leu Ser Arg Leu Gln Phe Tyr His Lys His Ser Val Pro Val
500 505 510

Tyr Phe Pro Ala Gln Asp Pro Arg Cys Asp Pro Lys Ala Thr Gly Val
515 520 525

Trp Gly Pro Trp Met
530

(2) INFORMATION FOR SEQ ID NO:14:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 583 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

Met Pro Leu Arg Lys Met Lys Ile Pro Phe Leu Leu Leu Phe Phe Leu
1 5 10 15

Trp Glu Ala Glu Ser His Ala Ala Ser Arg Pro Asn Ile Ile Leu Val
20 25 30

Met Ala Asp Asp Leu Gly Ile Gly Asp Pro Gly Cys Tyr Gly Asn Lys
35 40 45

Thr Ile Arg Thr Pro Asn Ile Asp Arg Leu Ala Ser Gly Gly Val Lys
50 55 60

Leu Thr Gln His Leu Ala Ala Ser Pro Leu Cys Ile Pro Ser Arg Ala
65 70 75 80

Ala Phe Met Thr Gly Arg Tyr Pro Val Arg Ser Gly Met Ala Ser Trp
85 90 95

63

Ser Arg Thr Gly Val Phe Leu Phe Thr Ala Ser Ser Gly Gly Leu Pro
 100 105 110
 Thr Asp Glu Ile Thr Phe Ala Lys Leu Leu Lys Asp Gln Gly Tyr Ser
 115 120 125
 Thr Ala Leu Ile Gly Lys Trp His Leu Gly Met Ser Cys His Ser Lys
 130 135 140
 Thr Asp Phe Cys His His Pro Leu His His Gly Phe Asn Tyr Phe Tyr
 145 150 155 160
 Gly Ile Ser Leu Thr Asn Leu Arg Asp Cys Lys Pro Gly Glu Gly Ser
 165 170 175
 Val Phe Thr Thr Gly Phe Lys Arg Leu Val Phe Leu Pro Leu Gln Ile
 180 185 190
 Val Gly Val Thr Leu Leu Thr Leu Ala Ala Leu Asn Cys Leu Gly Leu
 195 200 205
 Leu His Val Pro Leu Gly Val Phe Phe Ser Leu Leu Phe Leu Ala Ala
 210 215 220
 Leu Ile Leu Thr Leu Phe Leu Gly Phe Leu His Tyr Phe Arg Pro Leu
 225 230 235 240
 Asn Cys Phe Met Met Arg Asn Tyr Glu Ile Ile Gln Gln Pro Met Ser
 245 250 255
 Tyr Asp Asn Leu Thr Gln Arg Leu Thr Val Glu Ala Ala Gln Phe Ile
 260 265 270
 Gln Arg Asn Thr Glu Thr Pro Phe Leu Leu Val Leu Ser Tyr Leu His
 275 280 285
 Val His Thr Ala Leu Phe Ser Ser Lys Asp Phe Ala Gly Lys Ser Gln
 290 295 300
 His Gly Val Tyr Gly Asp Ala Val Glu Glu Met Asp Trp Ser Val Gly
 305 310 315 320
 Gln Ile Leu Asn Leu Leu Asp Glu Leu Arg Leu Ala Asn Asp Ile Leu
 325 330 335
 Ile Tyr Phe Thr Ser Asp Gln Gly Ala His Val Glu Glu Val Ser Ser
 340 345 350
 Lys Gly Glu Ile His Gly Gly Ser Asn Gly Ile Tyr Lys Gly Gly Lys
 355 360 365
 Ala Asn Asn Trp Glu Gly Gly Ile Arg Val Pro Gly Ile Leu Arg Trp
 370 375 380

Pro Arg Val Ile Gln Ala Gly Gln Lys Ile Asp Glu Pro Thr Ser Asn
 385 390 395 400
 Met Asp Ile Phe Pro Thr Val Ala Lys Leu Ala Gly Ala Pro Leu Pro
 405 410 415
 Glu Asp Arg Ile Ile Asp Gly Arg Asp Leu Met Pro Leu Leu Glu Gly
 420 425 430
 Lys Ser Gln Arg Ser Asp His Glu Phe Leu Phe His Tyr Cys Asn Ala
 435 440 445
 Tyr Leu Asn Ala Val Arg Trp His Pro Gln Asn Ser Thr Ser Ile Trp
 450 455 460
 Lys Ala Phe Phe Phe Thr Pro Asn Phe Asn Pro Val Gly Ser Asn Gly
 465 470 475 480
 Cys Phe Ala Thr His Val Cys Phe Cys Phe Gly Ser Tyr Val Thr His
 485 490 495
 His Asp Pro Pro Leu Leu Phe Asp Ile Ser Lys Asp Pro Arg Glu Arg
 500 505 510
 Asn Pro Leu Thr Pro Ala Ser Glu Pro Arg Phe Tyr Glu Ile Leu Lys
 515 520 525
 Val Met Gln Glu Ala Ala Asp Arg His Thr Gln Thr Leu Pro Glu Val
 530 535 540
 Pro Asp Gln Phe Ser Trp Asn Asn Phe Leu Trp Lys Pro Trp Leu Gln
 545 550 555 560
 Leu Cys Cys Pro Ser Thr Gly Leu Ser Cys Gln Cys Asp Arg Glu Lys
 565 570 575
 Gln Asp Lys Arg Leu Ser Arg
 580

(2) INFORMATION FOR SEQ ID NO:15:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 551 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

Met Lys Ser Ala Pro Phe Leu Phe Leu Leu Gly Leu Leu Gly Leu Val
 1 5 10 15

65

Thr	Ala	Gln	Thr	Gln	Asp	Pro	Ala	Leu	Leu	Asp	Leu	Leu	Arg	Glu	Asn	
			20					25					30			
Pro	Asp	Leu	Leu	Ser	Leu	Leu	Leu	Gln	Ser	Asn	Glu	His	Arg	Ala	Pro	
		35					40					45				
Leu	Val	Lys	Pro	Asn	Val	Val	Leu	Leu	Val	Ala	Asp	Asp	Met	Gly	Ser	
	50					55					60					
Gly	Asp	Leu	Thr	Ser	Tyr	Gly	His	Pro	Thr	Gln	Glu	Ala	Gly	Phe	Ile	
65					70					75					80	
Asp	Lys	Met	Ala	Ala	Glu	Gly	Leu	Arg	Phe	Thr	Asn	Gly	Tyr	Val	Gly	
				85					90					95		
Asp	Ala	Val	Cys	Thr	Pro	Ser	Arg	Ser	Ala	Ile	Met	Ile	Gly	Arg	Leu	
			100					105					110			
Pro	Val	Arg	Ile	Gly	Thr	Phe	Gly	Glu	Thr	Arg	Val	Phe	Leu	Pro	Trp	
		115					120					125				
Thr	Lys	Thr	Gly	Leu	Pro	Lys	Ser	Glu	Leu	Thr	Ile	Ala	Glu	Ala	Met	
	130					135					140					
Lys	Glu	Ala	Gly	Tyr	Ala	Ile	Gly	Met	Val	Gly	Lys	Trp	His	Leu	Gly	
145					150					155					160	
Met	Asn	Glu	Asn	Ser	Ser	Ile	Asp	Gly	Ala	His	Leu	Pro	Phe	Asn	His	
				165					170					175		
Gly	Phe	Asp	Phe	Val	Gly	His	Asn	Leu	Pro	Phe	Thr	Asn	Ser	Trp	Ser	
			180					185					190			
Cys	Asp	Asp	Thr	Gly	Leu	His	Lys	Asp	Phe	Pro	Asp	Ser	Gln	Arg	Cys	
		195					200					205				
Tyr	Leu	Tyr	Val	Asn	Ala	Thr	Leu	Val	Ser	Gln	Pro	Tyr	Gln	His	Lys	
	210					215					220					
Gly	Leu	Thr	Gln	Leu	Phe	Thr	Asp	Asp	Ala	Leu	Gly	Phe	Ile	Glu	Asp	
225					230					235				240		
Asn	His	Ala	Asp	Pro	Phe	Phe	Leu	Tyr	Val	Ala	Phe	Ala	His	Met	His	
				245					250					255		
Thr	Ser	Leu	Phe	Ser	Ser	Asp	Asp	Phe	Ser	Cys	Thr	Ser	Arg	Arg	Gly	
			260					265					270			
Arg	Tyr	Gly	Asp	Asn	Leu	Leu	Glu	Met	His	Asp	Ala	Val	Asp	Lys	Ile	
		275					280					285				
Val	Asp	Lys	Leu	Glu	Glu	Asn	Asn	Ile	Ser	Glu	Asn	Ile	Ile	Ile	Phe	
	290					295					300					

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Phe Ile Ser Asp His Gly Pro His Arg Glu Tyr Cys Glu Glu Gly Gly
 305 310 315 320
 Asp Ala Ser Ile Phe Arg Gly Gly Lys Ser His Ser Trp Glu Gly Gly
 325 330 335
 His Arg Ile Pro Tyr Ile Val Tyr Trp Pro Gly Thr Ile Ser Pro Gly
 340 345 350
 Ile Ser Asn Glu Ile Val Thr Ser Met Asp Ile Ile Ala Ile Ala Ala
 355 360 365
 Asp Leu Gly Gly Thr Thr Leu Pro Thr Asp Arg Ile Tyr Asp Gly Lys
 370 375 380
 Ser Ile Lys Asp Val Leu Leu Glu Gly Ser Ala Ser Pro His Ser Ser
 385 390 395 400
 Phe Phe Tyr Tyr Cys Lys Asp Asn Leu Met Ala Val Arg Val Gly Lys
 405 410 415
 Tyr Lys Ala His Phe Arg Thr Gln Arg Val Arg Ser Gln Asp Glu Tyr
 420 425 430
 Gly Leu Glu Cys Ala Gly Gly Phe Pro Leu Glu Asp Tyr Phe Asp Cys
 435 440 445
 Asn Asp Cys Glu Gly Asp Cys Val Thr Glu His Asp Pro Pro Leu Leu
 450 455 460
 Phe Asp Leu Met Arg Asp Pro Gly Glu Ala Tyr Pro Leu Glu Ala Cys
 465 470 475 480
 Gly His Glu Asp Val Phe Leu Thr Val Lys Ser Thr Val Glu Glu His
 485 490 495
 Lys Ala Ala Leu Val Lys Cys Thr Pro Leu Leu Asp Ser Phe Asp His
 500 505 510
 Ser Ile Val Pro Cys Cys Asn Pro Ala Asn Cys Cys Ile Cys Asn Tyr
 515 520 525
 Val His Glu Pro Gly Met Pro Glu Cys Tyr Gln Asp Gln Val Ala Thr
 530 535 540
 Ala Ala Arg His Tyr Arg Pro
 545 550

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